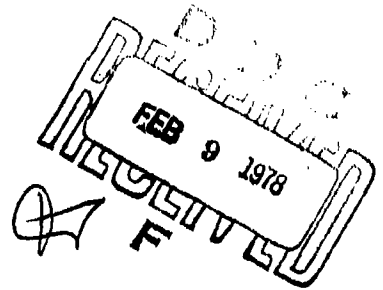


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# DECISION MAKING RESEARCH

DEPARTMENT OF PSYCHOLOGY  
DEPARTMENT OF MANAGEMENT AND ORGANIZATION  
UNIVERSITY OF WASHINGTON, SEATTLE, WASHINGTON

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DECISION MAKING RESEARCH  
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SEATTLE, WASHINGTON

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### SOURCES OF JUDGMENTAL UNCERTAINTY<sup>1</sup>

Olga L. K. Crocker  
University of Windsor  
Windsor, Ontario

Terence R. Mitchell and  
Lee Roy Beach  
University of Washington  
Seattle, Washington

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Final Condition	Timing of Information	Contingency Theory												
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Two studies examined the effects of information variables on judges' uncertainty about the accuracy of their judgments. In the first study results suggested that the degree of disorderliness of information was related to the degree of judgmental uncertainty but that control of the timing of information reception was not. The second study affirmed the effects of disorderliness and showed a strong effect of the reliability or unreliability of the information's source. Unreliable sources produced greater uncertainty. These results are discussed in terms of their implications for contingency theory concepts (see Block 19).														

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# Sources of Judgmental Uncertainty<sup>1</sup>

Olga L. K. Crocker

University of Windsor

Terence R. Mitchell and Lee Roy Beach

University of Washington

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Starting with the early work of Burns and Stalker (4), Woodward (18), Lawrence and Lorsch (15), and Thompson (16) there has been increasing interest in the idea that uncertainty plays an important role in organizational effectiveness. Essentially, it is argued that to perform effectively, an organization, its internal structure, and its decision making units must be able to adjust to and handle the uncertainty that exists in its environment. However, this line of reasoning (often called contingency theory) has left many investigators unhappy with the definition of uncertainty and with its conceptual links to other areas of theory, specifically, decision theory (6). One problem is that little emphasis has been placed on either the causes of uncertainty or its effects on the decision process. That is, while we know that uncertainty exists we have little information about its specific causes and how that uncertainty influences the various components of the decision process. A second problem is that the analysis of both environments and uncertainty is carried out at the level of aggregates of people (e.g., groups or organizations) and very little effort has been made to examine uncertainty as an individual psychological or perceptual variable as is done in decision research (8, 9).

In decision research uncertainty has typically been defined in terms of the individual's ability to specify action-outcome probabilities: Certainty exists when action-outcome probabilities are 1.00, risk exists when action-outcome probabilities are less than 1.00, but specifiable, and uncertainty exists when action-outcome probabilities are unknown. However, it has been suggested that the definition of uncertainty as the inability to generate a single probability

is too narrow (10); that is, in many cases a decision maker has an imprecise, general idea, or "ballpark" estimate of action-outcome probabilities. The degree of imprecision, i.e., the largeness or smallness of this "ballpark", can be interpreted as the decision maker's uncertainty about the action-outcome relationship (1, 3, 14).

The recent organizational literature has begun to reflect this line of thought (5). One component of Duncan's (7) measure of uncertainty is based on the ability of the decision maker to assign probabilities about the effect of various factors on the success or failure of a decision unit. Downey and Slocum (6) define uncertainty as a perceptual characteristic based upon an individual's less than complete knowledge of action-outcome relationships. Huber, O'Connell and Cummings (12) use two procedures reflecting an individual's probability and uncertainty estimates that various strategies would be used in a tactical and negotiations game. These studies evidence an effort to move to an individual level of analysis with uncertainty defined in terms of action-outcome relationships.

The purpose of the present research is to carry this line of thought one step further. First, uncertainty is defined as an individual's cognition and seen as the degree to which an action-outcome relationship is specifiable. A measure called the "equivalence interval" (EI) developed by Beach and Solak (3) is used to assess this uncertainty. Second, a number of factors in the decision task and in the information related to the task are manipulated in two separate experiments. In this way the direct causes of uncertainty can be specified rather than the global estimates of turbulence currently being used by many investigators.

The variables to be studied as causes of uncertainty came from a number of different areas of research. From contingency theory research came two ideas: First, we hypothesized that a random, unpredictable environment might produce

random or disorderly information. It should be more difficult to discern a meaningful pattern in disorderly information and uncertainty should result. The second idea from this literature involves the control of the information flow. A random or disorderly environment is more likely to be uncontrollable in terms of when information can be obtained. This lack of control over when information is obtained may cause greater uncertainty than when a stable, controllable flow of information is available.

There are also some possible causes of uncertainty that seem to be unrelated to whether the environment is stable or turbulent. These variables have been discussed in the decision research but are not part of the contingency literature. For example, one way in which decision researchers have suggested that uncertainty can be reduced is to decompose the decision problem into smaller units (17). A strategy that is often used is to have the decision maker engage in frequent evaluations and judgment revisions as he or she proceeds through the problem. In this manner, the final judgment is supposedly more accurate and the decision maker is supposedly less uncertain about the judgment than if one, final wholistic judgment is made.

A second factor of importance in decision research has been the characteristics of the source of information. The perceived reliability or status of the source has been shown to have a significant impact on the judgment process and on opinion revisions (2). The more reliable the source, the lower the uncertainty.

Finally, in some cases it has been found that the internal ordering of information items has an effect on judgments. In many cases the first few items bias the processing of later items. This is described as a primacy effect and it has been studied in the areas of attitude change, decision making and personnel selection. The more that initial items of information can be used as good indicators of one's overall judgment the lower should be the uncertainty.

In summary, the hypotheses were that greater psychological uncertainty occurs (as measured by the width of the equivalence interval) when:

1. Items of information appear in a disorderly rather than orderly fashion;
2. Someone other than the decision maker controls the flow of information;
3. One final judgment is made rather than a set of sequential judgmental revisions;
4. The source of the information is unreliable as opposed to reliable; and
5. Relevant items come last rather than first.

### EXPERIMENT 1

The first experiment asked subjects to read three short stories (scenarios) and analyze 20 items of information relevant to each story. At the end of each analysis a number of judgments were made. The control of the rate of information flow and the orderliness of the 20 information items served as the independent variables. Uncertainty (as assessed by the equivalence interval) and rated satisfaction with the judgments served as dependent variables.

#### Subjects

Seventy-two junior and senior undergraduate students from an introductory business course were randomly assigned to one of two conditions (no-control, control) and engaged in three decision tasks which varied in orderliness (high, moderate or low). The subjects were volunteers and were paid at the rate of \$3 per hour for their participation.

#### Procedure

The subjects were seated in a small room where there was a table, a tape recorder, a slide projector and screen and the experimenter. They were told that they would be participating in a study on decision making and given a brief description of what they would be required to do. At that time the concept of



an equivalence interval was explained to them. They had one practice scenario and made one set of judgments to make sure that everyone understood the procedure.

#### Task

Three scenarios (besides the practice scenario) were developed. Each scenario consisted of a short cover story and 20 simple binomial items of information (such as yes/no). The first scenario was:

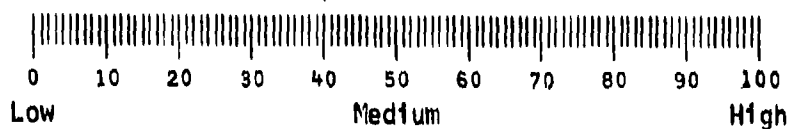
The employees of the company where you work are planning to donate a centennial gift to a business school (an undertaking that you personally have been working on for some time). The Employees Association has decided that they would ask each of the 1000 employees to contribute one dollar. You have been given the job of collecting the contributions. The president of the company announces that the company will match the employees' donations but must know in an hour the approximate amount which the employees will contribute. This is a difficult task but you decide to randomly sample a number of people from various company departments. The results of your request produced the pledges indicated on the slides.

The subject was shown 20 slides. Each slide contained the department from which one of 20 people came (out of 1000) and a simple \$1.00 or \$.00 next to it. The subject was asked to estimate the proportion of support in the company.

Scenario B had the subject estimate the proportion of companies (out of 1000) that would place an order for a specific product and the 20 slides contained the name of the company and a "yes" or "no". Scenario C concerned the degree of support for a political petition at a large university. A sample of 20 students (out of 1000) was presented on the slide (their name and year) and a "yes" or "no".

#### Measures

Two dependent variables were used. First, each subject made a proportion estimate as required by the task. This was done on a 100-point scale like the one below:



After this specific point estimate was made the subject was asked to place an equivalence interval (EI) around the answer. The specific instructions for making this judgment are available in Beach et al. (1). Essentially, the subject is asked to place a bracket (an upper and lower limit) around the point estimate. This bracket or interval demarks the range of answers within which the subject feels the true answer is reasonably likely to lie. The more uncertain the subject is of his or her point estimate the wider the interval; the more certain the subject is the narrower the interval. The width of the interval is the first dependent variable.

The second dependent variable was the subject's satisfaction with his or her judgment. A 100-point scale, similar to the one above, was used and the subject merely marked the scale at some point to indicate his or her satisfaction.

#### Manipulations

The subjects in the no control condition were yoked to the control condition subjects so that the time of exposure to each item of information would be equal for both groups. First, subjects were randomly assigned to pairs. Then, the first subject to be run in each pair controlled the speed at which slides appeared on the screen. This was done by pressing a button on a remote slide changer which the subject held. A cassette tape recorder recorded the sound of each slide change. When the second member of the pair was run, the experimenter had an earphone attached to her ear and she listened to the recording of the slide changes made by the first subject. Whenever a slide change occurred on the recording the experimenter changed the slide. Thus, half the subjects controlled the rate at which they were exposed to the information and the other half had the rate controlled by someone else.

Orderliness had three levels of treatment (high, moderate and low) and was defined as the number of shifts between positive and negative information items

(see 11, 13 for similar definitions). For example, the following three strings of items represent high, moderate and low orderliness (or D for "disorderliness") conditions:

<pre> + + + + + 0 + + 0 0 0 0 + + + + 0 + +       1 2 3      4      5 6           </pre>	D = 6
<pre> + 0 + + 0 + 0 0 0 + + + + + + 0 + + 0   1 2 3 4 5      6      7 8 9           </pre>	D = 9
<pre> + + + + 0 + 0 + + + 0 + 0 0 + 0 + + 0 +       1 2 3 4      5 6 7      8 9 10 11 12           </pre>	D = 12

Note that in all three strings the proportion of positive items is the same (13/20). It is only the order of their presentation which is different.

Each subject saw a scenario of high (D = 6), moderate (D = 9) and low (D = 12) orderliness. This D level was represented by the pattern of yes/no slides that appeared on the screen.

#### Other Experimental Controls

Three other precautions were taken with respect to the design of the study. First, the design is basically a 2(levels of control) by 3(levels of orderliness) design with orderliness being a repeated measure. The three scenarios can be presented in six different orders and an equal number of these different orders was used in the control and no control conditions. This procedure controlled for possible order effects.

Second, in some cases positive items appeared in the beginning and sometimes at the end. To avoid primacy or recency effects, which were not part of this first study, for half of the subjects the orders of information items were the reverse of the orders for the other subjects. While D remains the same, the pattern of items becomes a mirror image of the initial ordering.

Finally, to avoid the problem of subjects simply counting the number of positive items in one or two of the scenarios and then using that judgment for

later judgments a number of procedures were used. First, subjects were asked not to count. We requested that "intuitive" judgments be made. Second, we had found from pilot studies that it was hard to remember more than 15 items of information presented on a screen in this fashion. We chose 20 items to decrease the chances of counting. As a last precaution we varied slightly the proportion of positive and negative items in each scenario. Scenario A had a P of .60 (12 out of 20 items were positive); B was .65 and C was .70; D was counterbalanced within each scenario across Ss.

To summarize, 72 subjects were randomly assigned to two conditions of control and exposed to three conditions of orderliness. Order effects and primacy/recency effects were counterbalanced and precautions were taken to prohibit the subject from using counting as a decision strategy. The design is presented in Table 1.

-----  
Insert Table 1 about here  
-----

#### RESULTS OF EXPERIMENT 1

Two 2 x 3 analyses of variance with repeated measures were conducted with the two levels of control and the three levels of orderliness serving as the independent variables in both, and either the EI or satisfaction measures serving as the dependent variables. There were no main effects for control or orderliness and no interaction in either analysis. These tests failed initially to support our hypothesis.

However, the feedback we had received from the non-control (experimenter controlled) subjects had caused us to question the effectiveness of this condition. Some of the subjects reported that the tape recorder and earphone were somewhat distracting. It was also apparent that, since the control subjects

Table 1

Assignment of Subjects within the Control/No Control Conditions

where A, B, C designate scenarios; H, M, L designate

levels of orderliness (high, medium, low);

and P, R stands for primacy, recency

<u>Subject Pair</u>	<u>Treatment</u>			<u>Primacy/Recency</u>
01	CL	AH	BM	R
02	BH	CL	AM	R
03	BL	CM	AH	P
04	AL	BH	CM	R
05	AM	AH	CL	R
06	CM	BL	AH	P
07	CH	AM	BL	P
08	CH	AL	BM	R
09	AM	CH	BL	R
10	AH	BM	CL	P
11	BL	AM	CH	P
12	AH	CL	BM	R
13	CM	AL	BH	P
14	AH	CM	BL	P
15	AM	CL	BH	P
16	CM	AH	BL	R
17	CL	AM	BH	P
18	BM	AL	CH	P
19	BM	CL	AH	P
20	BH	AL	CM	R
21	BH	CM	AL	P
22	CL	BM	AH	P
23	AM	BL	CH	P
24	BL	CH	AM	R
25	AL	CH	BM	R
26	AL	CM	BH	P
27	AH	BL	CM	R
28	BH	AM	CL	P
29	CH	BL	AM	R
30	BM	CH	AL	R
31	AL	BM	CH	P
32	CH	BM	AL	P
33	CM	BH	AL	R
34	BL	AH	CM	R
35	CL	BH	AM	R
36	AM	CH	CL	R

had not in general tried to rush through the experiment, the non-control subjects experienced little pressure due to lack of control. They reported this fact to us.

Therefore, two one-way repeated measures analyses of variance were conducted for the control subjects with three levels of orderliness as the independent variables and either EI or satisfaction as the dependent variables. In these analyses the main effect for orderliness was marginally significant ( $F = 2.7$ ,  $p < .07$ ) for the EI but not significant for satisfaction.

The means of the three orderliness conditions seemed to support our hypothesis. The EI for high orderliness was 16.97, for moderate orderliness it was 20.50, and for low orderliness it was 21.67. Increasing levels of uncertainty were associated with decreasing levels of orderliness. This result was as predicted and it encouraged us to pursue these findings further.

## EXPERIMENT 2

In the second experiment subjects were asked to evaluate the probable job success of eight hypothetical job candidates. Each candidate was described in terms of 20 items of descriptive or biographical information. The independent variables were the orderliness of the information (high vs. low), the status of the source of information (high vs. low), the particular pattern of information items (primacy vs. recency) and the way in which judgments were made (sequential vs. final). The dependent variables were the EI placed around the judged probability of success and the rated satisfaction with that judgment.

### Subjects.

Eighty-four junior and senior undergraduates from introductory business courses participated as subjects. They were volunteers and were paid \$3 per hour. They were randomly assigned to either the sequential or final judgment treatments.

## Procedure

The experiment was conducted in a room with a large table, a slide projector, and a screen. The subjects were run in groups of one to nine. They were brought in, given an explanation of the experiment and given an answer booklet. Each of the 20 items of information for each candidate was shown on the screen for seven seconds with a three second pause between slides. At the end of each set of slides they made ratings of that particular candidate and then proceeded on to the next person. The experimenter controlled the rate at which the slides were presented.

## Task

This task was somewhat more meaningful than the one used in the first experiment. The subjects were told to imagine that a large corporation had placed an advertisement in the local newspaper asking for management trainees. A copy of the ad was provided. They were told that over 60 applications had been received and that everyone had gone through extensive tests conducted by outside employment agencies. The choice had been narrowed down to eight people and it was these people that the subjects would be asked to rate.

The subjects were told that they would be asked to rate each candidate based on the candidate's characteristics on a set of 20 criteria (e.g., health, education, ambition, flexibility, experience, etc.). They were informed that the corporation had developed these 20 criteria over a series of years. Table 2 presents the 20 criteria and a representative information item for each. For all eight candidates there were 14 positive and 6 negative ones. Thus, as in the first experiment the stimuli in this experiment consisted of strings of positive or negative items of information.

-----  
Insert Table 2 about here  
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Table 2

List of 20 Criteria and Examples of Information Items for Candidate Number Four

<u>Candidate No. 4</u>	<u>Item Rating</u>
<u>Innovation</u> Our Company looks for people who have new and relevant ideas. Received a bonus for a number of new original ideas on past jobs.	2.7
<u>Objectives</u> Behavior illustrates a sense of direction or purpose, i.e., is able to specify priorities correctly.	2.6
<u>Flexibility</u> This candidate follows the rules but is not afraid to overlook a rule or bend it if the situation should warrant this. The company prefers people who are flexible.	2.4
<u>Education</u> Is presently taking the first year of a M.Sc. in Business Administration. Our company prefers that trainees have at least completed their bachelor's degree.	2.4
<u>Health</u> Health seems to be excellent. Looks and acts fit. Should be able to work the long hours required of this position.	2.3
<u>Selection Exercises</u> Has the scholastic aptitude and forcefulness to become a successful manager. This was confirmed in the selection exercises which the applicant performed.	1.9
<u>Challenge</u> Likes challenge. Managers who like challenge tend to be more successful.	1.6
<u>Literary Interests</u> Prefers to read autobiographies and books concerning travel and foreign countries. This background should be particularly helpful in meeting clients and managers from foreign countries.	1.5
<u>Risk-taking Propensity</u> Has not been willing to take risks in the past even after analyses indicates that risky action is most appropriate. Managers with this company must be willing to take risks.	-2.1
<u>Interpersonal Orientation</u> Does not get along well with colleagues. This type of manager may experience problems in adjusting to new situations.	-1.6
<u>Individual Autonomy</u> Seems unsure of ability to perform alone. Wants others to share the responsibility for decisions made.	-1.7



Table 2 (Continued)

	<u>Item Rating</u>
<u>Athletic Activities</u> Is sports minded. Is golf champion for age group. Also plays tennis and badminton. The company prefers all-round persons and judges participation in sports as important.	1.7
<u>Group Identification</u> Appears to lack loyalty to the organization as a whole. Our company prefers that individuals be loyal to the organization rather than their particular work group.	-1.6
<u>Ambition</u> Ambition is to become highly paid and respected. Would like to be president of the company someday.	2.3
<u>Extra-curricular activities</u> Has held numerous executive positions and participated extensively in committee work while in school. This is regarded as good outside experience.	2.3
<u>Career Orientation</u> Is very career oriented and is always looking for an opportunity to work on challenging jobs.	2.6
<u>Leaderless Group Discussion</u> In a leaderless group discussion, however, the applicant failed to be recognized as a leader by the peer group. Any contributions that were made were insignificant.	-2.3
<u>Appearance</u> Came for job interview poorly dressed. Had a disorganized appearance.	-2.5
<u>Administrative Skills</u> Possesses the skills needed for daily administrative duties; is orderly and methodical.	2.4
<u>Experience</u> Has been out of school for one year. Worked for the Government in the Systems Analysis Division and wrote some outstanding reports and programs for systems improvement.	2.7

The major experimental control problem was to ensure that each of these 20 items of information were reliably seen as either positive or negative and that each candidate was seen as being about equally attractive as any other candidate. A number of steps were taken to ensure that this was the case.

First, the subjects were informed that the corporation's experience with candidates had shown that these 20 criteria were equally important for success on the job. The higher the number of favorable attributes, the greater the probability that the candidate would be successful. The subjects were requested, therefore, to weight each item equally when making their success judgments.

Also, an attempt was made to ensure that the criteria were in fact equal. To ensure comparability a group of 15 business students (who did not participate in the experiment itself) had been asked to rate 160 items. There were four positive and four negative items presented for each of the 20 criteria and they were rated on a 6-point bipolar scale ranging from -3 (very unfavorable) to +3 (very favorable). Thirteen items were randomly selected to be presented twice and the average test-retest reliability coefficients for these items was .73 with 12 of 13 significant at the .05 level and one nearly so. These coefficients provided confidence in these judges' ratings.

Then the mean judgments for each of the information items was calculated. All items that had values greater than  $\pm 1.7$  were included as items which were clearly positive or negative. Items with values failing to reach  $\pm 1.7$  or with high variance were discarded. This procedure was then repeated with a second group of 15 judges and the surviving items were used as a pool from which the experimental items were drawn.

Beside the problem of having reliably positive and negative items within each candidate's profile it was necessary to ensure that the eight descriptions were roughly parallel to one another. The ratings made by the preliminary sample

of business students were used to establish comparability. To the extent possible, a maximum deviation of  $\pm .3$  was allowed among items across scenarios. In other words, all items which appear first in each of the eight scenarios had been given a mean range of 2.5 to 2.8 by the pilot sample; all items which appear second had been given a mean range of 2.4 to 2.6, etc. Table 3 below gives a summary of the means for the positive and negative items of information. Differences in the overall means among the positive items for the eight candidates are barely discernible (the high is 2.29 and the low is 2.24, a difference of only 0.05). There is slightly more variation in the overall means among the negative items (high of -1.87 and low of -2.15, or a difference of 0.28). This variation, however, is still fairly small.

-----  
Insert Table 3 about here  
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### Manipulations

There were four independent variables and the manipulation of each one is described below.

Judgment Procedure--Subjects were assigned to either a sequential judgment condition or a final judgment condition. In the sequential condition each subject rated a candidate's probability of success after viewing each item of information. In the final condition, one summary judgment was made after all twenty items of information about a particular candidate had been observed.

To facilitate the sequential judgments, subjects were provided with sets of scales for each of the eight candidates that they would evaluate. Each scale was calibrated so that any probability level from 0.0 to 1.0 could be marked. Additionally, the beginning of the scale (0.0) was defined as a "very low probability of success"; the end of the scale (1.0) was designated as a "very high probability of success".

Table 3

## Overall Means for Information used in Candidate Profiles

<u>Candidate Number</u>	<u>Overall Mean Positive Items</u>	<u>Overall Mean Negative Items</u>
1	2.28	-2.08
2	2.28	-2.13
3	2.27	-1.87
4	2.29	-2.03
5	2.24	-1.93
6	2.25	-2.15
7	2.25	-2.12
8	2.26	-1.92

The subject in the sequential condition saw each slide (item of information), revised his/her opinion regarding the probability that the particular management trainee would be successful and marked this on a scale. To prevent the subject from seeing a pattern which might be developing, previously marked scales were turned face down when the recording of the judgment was completed. In the analyses, the evaluation of each of the items was disregarded and only the last judgment made was analyzed. The subjects, at the time of the experiment, were not aware how the data would be treated.

Source Status--The status of the source was manipulated through the presentation of information about the source prior to the subject's viewing of a candidate's 20 information items. Before seeing the slides a one-page description of the source of information (the person and the company involved) were presented to the subject. Four of these sources were designed to be of high status and four of low status.

Fifteen judges (business students who did not participate in the experiment) were asked to rate these source descriptions on two six-point bi-polar scales (+3 to -3) in terms of (1) the degree to which the agency and individual involved had high prestige and (2) the reliability of this information source. Analyses of variance showed that for both questions the sources were significantly differently rated. The means for the prestige question were 2.51 for high status sources and -.98 for low status sources ( $F = 231.09, p < .001$ ). The means for the reliability question were 2.61 for high status sources and -.49 for low status sources ( $F = 258.50, p < .001$ ). An example of a high status source is presented below:

Evaluation of the fourth candidate is by Harold Kubber:

Harold Kubber is National Secretary of the International Association of Personnel Administrators. A special department within IAPA has been set up to carry out research on the assessment of managerial talent. Each year, this department offers its

services free of charge to a limited number of member companies. Although it makes only a few evaluations, for these, it spares no expense--the best available experts and testing devices are always utilized in the evaluation of candidates.

Kubber graduated five years ago with a M.B.A. from the University of Vermont. He is well-known in management assessment circles. Kubber's leadership and innovative ideas, particularly in this management assessment program, have earned IAPA and Kubber himself the recognition, admiration, and respect of member organizations.

Orderliness--This variable was defined in the same fashion as in Experiment 1. The items were put together in a string with a D either of 12 or 6 with the former representing low orderliness and the latter representing high orderliness.

Primacy/Recency--The two strings mentioned above (high or low D) were both constructed to have long runs of positive information. For half the subjects these runs came at the beginning of the profile presentation. The other half saw the exact opposite order which placed these runs at the end of the profile. The sequence for candidate 4 (where D = 6) for example was as follows:

Primacy ++++++oooo+o+++oo++ D = 6

Recency ++oo+++o+oooo+++++++ D = 6

Each subject saw four profiles with a primacy ordering and four with a recency ordering.

#### Measures

The same measures used in Experiment 1 were used in Experiment 2. The subject rated the probability of each candidate succeeding on the job on the 100-point calibrated scale shown before. An equivalence interval was placed around this judgment and a separate 100-point scale assessed their satisfaction with their judgment.

#### Overall Design

Each of the four independent variables has two treatment levels which results in 16 experimental conditions. Schematically, this can be shown as follows:

F i n a l								S e q u e n t i a l							
High Orderliness				Low Orderliness				High Orderliness				Low Orderliness			
High Status		Low		High Status		Low		High Status		Low		High Status		Low	
Prim	Rec	Prim	Rec	Prim	Rec	Prim	Rec	Prim	Rec	Prim	Rec	Prim	Rec	Prim	Rec
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

The orderliness, status and primacy/recency variables are repeated measures and subjects are nested within the final/sequential variable.

Treatments and order of candidates for all small group sessions were randomly assigned to the respective group. Each small group was either in the sequential or final judgment condition and responded to an identical set of  $2 \times 2 \times 2$  experimental conditions (high/low orderliness  $\times$  primacy/recency  $\times$  high/low status). The order of presentation was scrambled for each group.

## RESULTS

The two dependent variables were subjected to a  $2 \times 2 \times 2 \times 2$  analysis of variance with repeated measures. Since the complexity of three-way and four-way interactions in most cases defies meaningful explanation (and only two three-ways were significant) we will stick to a discussion of only the main effects and two-way interactions.

For the EI measure of uncertainty, orderliness and source status were significant while the primacy/recency and sequential/final treatments were not. There were no two-way interaction effects.

The subjects in the high orderliness condition had a mean EI of 20.15 and in the low orderliness condition this mean was 21.87 ( $F = 5.33, p < .03$ ). The high orderliness condition produced slightly but significantly less uncertainty than the low orderliness condition. This result was as predicted and replicates the finding from Experiment 1.

The mean EI for the profiles with high status sources was 18.52 and for low status sources it was 23.50 ( $F = 29.04, p < .001$ ). High status sources produced less uncertainty than low status sources. This result also was as predicted.

For the satisfaction dependent variable the only main effect that was significant was for the status of the source. There were no significant two-way interactions. The means for the satisfaction measure were in the predicted direction. The mean satisfaction for high status sources was 71.72 and for low status sources it was 61.40 ( $F = 42.87, p < .001$ ). A high status source resulted in higher satisfaction with the judgment than a low status source.

### DISCUSSION

In Experiment 1 we found that orderliness was marginally related to the uncertainty criterion while control was unrelated to it. In Experiment 2 orderliness again was found to be related to the uncertainty variable as was the status of the source. The primacy/recency and sequential/final manipulations failed to produce a reliable change in uncertainty. The satisfaction variable was affected by only the source status manipulation in the second experiment.

From a methodological perspective the findings suggest that uncertainty can be defined and measured in a fashion which produces reliably replicable results. The important point is that uncertainty can be seen as the degree to which a decision maker feels comfortable with the assignment of a specific action-outcome probability. This new definition contrasts rather markedly with the traditional view that uncertainty only occurs when the decision maker is unable to assign these probabilities.

The substance of the results needs comment as well. The fact that the orderliness of the information was related to uncertainty in both studies is important. These two experiments involved different people working on different decision problems. The findings suggest that one way in which a random, unstable,



external environment causes uncertainty is through the lack of order or patterning of information items that are used by the decision maker. Future contingency studies should pursue this idea.

It is apparent that the status of the source is also an important factor in producing uncertainty about judgments and in producing satisfaction with those judgments. This result is not surprising, it has been found before. What is important, however, is the theoretical implications of the finding. Most contingency theories using environmental uncertainty concepts do not include factors like source status; one would be hard-pressed to come up with a rationale for why a random or a stable environment should result in information sources of high or low status. There does not seem to be a logical connection. Yet the findings from Experiment 2 suggest that source status was far and away the most important cause of psychological uncertainty. The variance in uncertainty controlled by the source status manipulation was 26%. This figure was only 5% for the orderliness manipulation.

At the beginning of this article it was mentioned that many contingency theorists define uncertainty in terms of environmental variables such as complexity, randomness and unpredictability. The present findings suggest that such conceptualizations are incomplete because a major contributor to uncertainty, source status, has been overlooked. For this reason we would argue that the causes of uncertainty and the concept of uncertainty itself should be theoretically and methodologically distinct and separate. In this fashion a more comprehensive theory of decision uncertainty can hopefully evolve.

FOOTNOTES

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University of Maryland  
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Duke University  
Duke Station  
Durham, NC 27706

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Dean, Graduate School  
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Irvine, CA 92650

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Systems and Evaluations  
232 Swanton Blvd.  
Santa Cruz, CA 95060

Dr. Paul Wall  
Division of Behavioral Science  
Tuskegee Institute  
Tuskegee, AL 36088

Navy Personnel R & D Center  
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San Diego, CA 92152

Mr. Luigi Petrullo  
2431 N. Edgewood St.  
Arlington, VA 22207

Dr. John J. Collins  
6305 Caminito Estrellado  
San Diego, CA 92120

Commanding Officer  
1 Psychological Research Unit  
Chancery House  
485 Bourke St.  
Melbourne vic 3000 AUSTRALIA

Director, Engineering Psychology  
Programs, Code 455  
Office of Naval Research  
800 North Quincy Street  
Arlington, Virginia 22217

Lt. Col. Henry L. Taylor USAF  
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Pentagon, Rm, 3D129  
Washington, D.C. 20301

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Dept. of the Navy  
Washington, D.C. 20350

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of Naval Operations  
Dept. of the Navy  
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Washington, DC 20380

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APO San Francisco 96503

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Engineering Branch, Code 4701  
Washington, D.C. 20360

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Naval Medical R&D Command  
Code 44, Naval Medical Center  
Bethesda, MD 20014

Director, Behavioral Sciences  
Department  
Naval Medical Research Inst.  
Bethesda, MD 20014

Dr. George Moeller, Head  
Human Factors Engineering Br.  
Submarine Med. Research Lab.  
Naval Submarine Base  
Groton, CT 06340

Bureau of Naval Personnel  
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Research Liaison  
PERS-OR  
Washington, DC 20370

Dr. Fred Muckler  
Manned Systems Design, Code 311  
Navy Personnel Research and  
Development Center  
San Diego, CA 92152

LCdr Mike O'Bar, Code 305  
Navy Personnel Research and  
Development Center  
San Diego, CA 92152

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Human Factors Engineering Br.  
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Naval Air Development Center  
Johnsville, Warminster, PA 18974

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Head, Human Factors Division  
Naval Electronics Lab. Center  
San Diego, CA 92152

Dr. Alfred F. Smode  
Training Analysis & Evaluation  
Group, Naval Training Equipment  
Center, Code H-00T  
Orlando, FL 32813

Mr. J. Barber  
Headquarters DA  
DAPE-PBR  
Washington, DC 20546

Dr. Joseph Zeidner, Director  
Organization & Systems Res. Lab.  
U.S. Army Research Institute  
1300 Wilson Boulevard  
Arlington, VA 22209

Dr. Edgar M. Johnson  
Organizational & Systems Research  
U.S. Army Research Lab  
1300 Wilson Boulevard  
Arlington, VA 22209

Technical Director  
U.S. Army Human Engineering Labs  
Aberdeen Proving Ground  
Aberdeen, MD 21005

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Chief, Human Engineering Div.  
Aerospace Medical Research Lab  
Wright-Patterson AFB  
Ohio 45433

Dr. Donald A. Topmiller  
Chief, Systems Effect. Branch  
Human Engineering Division  
Wright Patterson AFB, OH 45433

Lt. Col. Joseph A. Birt  
Human Engineering Division  
Aerospace Medical Research Lab.  
Wright Patterson AFB, OH 45433

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Tyson's International Bldg.  
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Vienna, VA 22180

Dr. Victor Fields  
Montgomery College  
Dept. of Psychology  
Rockville, MD 20850

Dr. Bruce M. Ross  
Catholic University  
Department of Psychology  
Washington, DC 20064

Dr. Robert R. Mackie  
Human Factors Research, Inc.  
Santa Barbara Research Park  
6780 Cortona Drive  
Goleta, CA 93017

Mr. Alan J. Pesch  
Eclectech Associates, Inc.  
P.O. Box 179  
North Stonington, CT 06359

Dr. A. I. Siegel  
Applied Psychological Services  
404 E. Lancaster Street  
Wayne, PA 19087

Dr. W. S. Vaughan  
Oceanautics, Inc.  
3308 Dodge Park Road  
Landover, MD 20785

Director, Human Factors Wing  
Defense & Civil Institute of  
Environmental Medicine  
P.O. Box 2000  
Downsville, Toronto, Ontario

Dr. A. D. Baddeley, Director  
Applied Psychology Unit  
Medical Research Council  
15 Chaucer Rd., Cambridge,  
CB2 2EF ENGLAND

Major David Dianich  
DSMS  
Building 202  
Fort Belvoir, VA 22060

Mr. Frank Moses  
U.S. Army Research Institute  
1300 Wilson Boulevard  
Arlington, VA 22209

Dr. Bertram Spector  
CACI, Inc. - Federal  
1815 N. Fort Myer Drive  
Arlington, VA 22209

Robert G. Gough, Major, USAF  
Associate Professor  
Dept. of Economics, Geography,  
and Management  
USAF Academy, Colorado 80840

Dr. C. Kelly  
Decisions and Designs, Inc.  
Suite 600, 7900 Westpark Dr.  
McLean, VA 22101

Dr. T. Owen Jacobs  
P.O. Box 3122  
Ft. Leavenworth, Kansas 66027

Mr. George Pugh  
General Research Corp.  
7655 Old Springhouse Road  
McLean, VA 22101

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Operations Research Department  
Naval Postgraduate School  
Monterey, CA 93940

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Integrated Sciences Corp.  
1532 Third Street  
Santa Monica, CA 90401

Dr. Jesse Orlansky  
Institute for Defense Analyses  
400 Army-Navy Drive  
Arlington, VA 22202

Dr. Amos Freedy  
Perceptronics, Inc.  
6271 Varie Avenue  
Woodland Hills, CA 91364

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Institute for Psychology  
Technical University  
8000 Munich, Arcisstr 21  
Federal Republic of GERMANY

Dr. Paul Slovic  
Oregon Research Institute  
P.O. Box 3196  
Eugene, OR 97403

Dr. Arthur Blaiwes  
Naval Training Equip. Center  
Orlando, FL 32813

Dr. A. C. Miller III  
Stanford Research Inst.  
Decision Analysis Group  
Menlo Park, CA 94025

Dr. William A. McClelland  
Human Resources Research Office  
300 N. Washington Street  
Alexandria, VA 22314

Dr. R. A. Howard  
Stanford University  
Stanford, CA 94305

Dr. Ward Edwards, Director  
Social Science Research Inst.  
University of Southern Calif.  
Los Angeles, CA 90007